Hex D-type flip-flop with reset; positive-edge trigger 74HC/HCT174

FEATURES

- Six edge-triggered D-type flip-flops
- Asynchronous master reset
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT174 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT174 have six edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common clock (CP) and master reset ($\overline{MR}$) inputs load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D input, one set-up time prior to the LOW-to-HIGH clock transition, is transferred to the corresponding output of the flip-flop.

A LOW level on the $\overline{MR}$ input forces all outputs LOW, independently of clock or data inputs.

The device is useful for applications requiring true outputs only and clock and master reset inputs that are common to all storage elements.

QUICK REFERENCE DATA

GND = 0 V; T_{amb}= 25 °C; $t_r = t_f$ = 6 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/ t_{PLH}	propagation delay	C_L = 15 pF; V_{CC} = 5 V			
	CP to Q_n		17	18	ns
	$\overline{MR}$ to Q_n		13	17	ns
f_{max}	maximum clock frequency		99	69	MHz
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per flip-flop	notes 1 and 2	17	17	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:

   f_i = input frequency in MHz

   f_o = output frequency in MHz

   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

   C_L = output load capacitance in pF

   V_{CC} = supply voltage in V

2. For HC the condition is V_I = GND to V_{CC}
   For HCT the condition is V_I = GND to V_{CC} – 1.5 V

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
74HC174N; 74HCT174N	DIP16	plastic dual in-line package; 16 leads (300 mil); long body	SOT38-1
74HC174D; 74HCT174D	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HC174DB; 74HCT174DB	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HC174PW; 74HCT174PW	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1	$\overline{MR}$	asynchronous master reset (active LOW)
2, 5, 7, 10, 12, 15	Q_0 to Q_5	flip-flop outputs
3, 4, 6, 11, 13, 14	D_0 to D_5	data inputs
8	GND	ground (0 V)
9	CP	clock input (LOW-to-HIGH, edge-triggered)
16	V_{CC}	positive supply voltage

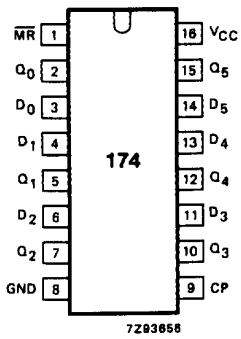


Fig.1 Pin configuration.

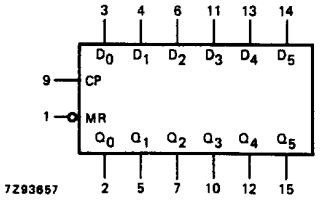


Fig.2

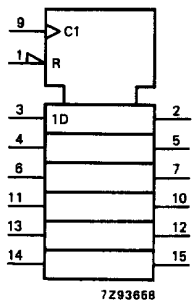


Fig.3 IEC logic symbol.

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard
I_{CC} category: MSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications. To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

INPUT	UNIT LOAD COEFFICIENT
D_n	0.25
CP	1.30
$\overline{MR}$	1.25

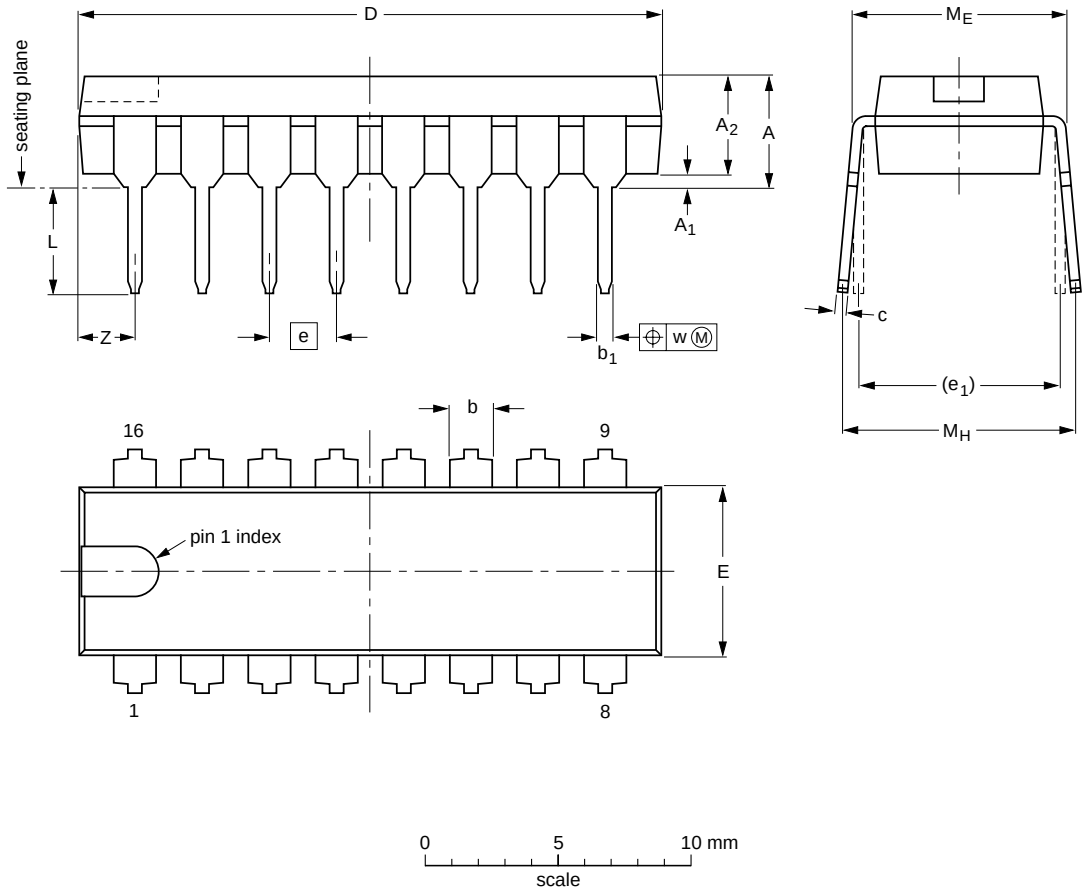
AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			–40 to +85		–40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay CP to Q_n		21	35		44		53	ns	4.5	Fig.6
t_{PHL}	propagation delay $\overline{MR}$ to Q_n		20	35		44		53	ns	4.5	Fig.7
t_{THL}/ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.6
t_W	clock pulse width HIGH or LOW	16	7		20		24		ns	4.5	Fig.6
t_W	master reset pulse width; LOW	20	7		25		30		ns	4.5	Fig.7
t_{rem}	removal time $\overline{MR}$ to CP	12	–3		15		18		ns	4.5	Fig.7
t_{su}	set-up time D_n to CP	16	4		20		24		ns	4.5	Fig.8
t_h	hold time D_n to CP	5	–3		5		5		ns	4.5	Fig.8
f_{max}	maximum clock pulse frequency	30	63		24		20		MHz	4.5	Fig.6

PACKAGE OUTLINES

DIP16: plastic dual in-line package; 16 leads (300 mil); long body **SOT38-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.7	0.51	3.7	1.40 1.14	0.53 0.38	0.32 0.23	21.8 21.4	6.48 6.20	2.54	7.62	3.9 3.4	8.25 7.80	9.5 8.3	0.254	2.2
inches	0.19	0.020	0.15	0.055 0.045	0.021 0.015	0.013 0.009	0.86 0.84	0.26 0.24	0.10	0.30	0.15 0.13	0.32 0.31	0.37 0.33	0.01	0.087

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	
	IEC	JEDEC	EIAJ			
SOT38-1	050G09	MO-001AE				